ABSTRACT OF THE DISCLOSURE

Stent delivery devices and methods include multiple stents or stent segments mounted at fixed positions on an expandable member of the stent delivery catheter. One or more of the fixed-position stents may be selectively deployed in a body lumen such as a blood vessel by positioning one or more sheaths to constrain some stents while exposing others for deployment. Some embodiments include two axially movable sheaths for serially deploying stents while containing a portion of the expandable balloon from which stents have been deployed. Other embodiments include inner and outer balloon shafts to allow the balloon to be retracted into the delivery catheter as stents are deployed. Devices and methods of the invention provide enhanced serial deployment of multiple stents or stent segments while reducing the risk of damage to an expandable deployment member.